REMARKS

Reconsideration And Allowance Are Respectfully Requested.

Claims 1-9, 23 and 24 are currently pending. Claim 24 has been amended. Claims 10-22 and 25 were previously canceled. No claims have been added. No new matter has been added. Reconsideration is respectfully requested.

With regard to the outstanding rejections, claims 1-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "High-Directivity Patch Antenna with Both Photonic Bandgap Substrate and Photonic Bandgap Cover" to Qiu et al. ("Qiu"), in view of U.S. Patent Application Publication No. 2003/0142036 to Wilhelm et al. ("Wilhelm"). Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Qiu in view of Wilhelm and U.S. Patent Application Publication No. 2003/0052834 to Sievenpiper et al. ("Sievenpiper"). Claims 1-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,927,729 to Legay ("Legay") in view of Qiu. Claims 23 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Legay in view of Qiu and U.S. Patent No. 6,850,205 to Yamamoto et al. ("Yamamoto"). These rejections are respectfully traversed in view of the preceding amendments and the remarks which follow.

Claim 1 defines a device for controlling electromagnetic radiation emitted by a structure. The device has a first surface and a second reactive surface defining a cavity therebetween. The first surface is an equipotential surface and presents a capacitive surface impedance. The second reactive surface comprises a lattice array of conductors disposed on a dielectric surface such that the

displacement between a conductor in the array and any other conductor adjacent to it in the array is small compared to the wavelength of the electromagnetic radiation thereby causing the array of conductors to represent an effectively continuous conductive surface to the electromagnetic radiation. A surface impedance of the second reactive surface is reactive. An emitter generating electromagnetic radiation is positioned between the first surface and the second reactive surface. The electromagnetic radiation within the cavity is radiated into the air through the second reactive surface.

The Office Action acknowledges the failure of Qiu to disclose that "the first surface is an equipotential surface and presents a capacitive surface impedance". The Office Action further acknowledges Qiu's failure to disclose that "the second reactive surface comprises a lattice array of conductors disposed on a dielectric surface such that the displacement between a conductor and any other conductor adjacent to it is small compared to the wavelength of the electromagnetic radiation thereby causing the array of conductors to represent an effectively continuous conductive surface to the electromagnetic radiation, wherein a surface impedance of the second reactive surface is reactive".

With regard to the claimed first surface, the Office Action indicates that "Qiu teaches that PGB [sic] structures can be a dielectric or a metallic periodic structure". However, this disclosure does not read upon a first surface that "is an equipotential surface and presents a capacitive surface impedance". Those skilled in the art will appreciate that an equipotential surface is one which exhibits a constant potential thereacross; something which is neither disclosed nor suggested by Qui.

In contrast, Qiu merely discloses what is known in the prior art, that is, PBG materials are periodic dielectric structures or periodic metallic structures. This in no way discloses or suggests that Qiu provides for a first surface that is equipotential. Still further, it does not provide an indication as to Qui disclosing a first surface presenting a capacitive surface impedance as claimed.

In particular, Qiu aspires to use the stop band properties of PBG, while the present invention avoids the usage of resonant structures like PBG as the large electrical size of such PBG structures is undesirable. As a result of the specific design consideration employed in the implementation of the claimed invention, the claimed invention provides for a reactive surface antenna having a size smaller (or much smaller) than $\lambda/10$ at the operating frequency which is not possible when using a PBG structure. **Unlike Qiu, this size comprises all the structure including the reactive surface and the cavity.** The antenna of the type Qiu disclosed has found little practical application since the overall size of the structure is far larger than the size of the radiator due to the dimension of the PBG structure which can extend to more than one wavelength. As a result of the large electrical size of the Qiu structure, there is a reported increase in directivity. This effect is not possible and not desirable in the present invention due to its small overall size which is a direct result of not using a PBG structure.

As to the failure of Qiu to disclose that "the second reactive surface comprises a lattice array of conductors disposed on a dielectric surface such that the displacement between a conductor and any other conductor adjacent to it is small compared to the wavelength of the electromagnetic radiation thereby causing the array of conductors to represent an effectively continuous conductive

surface to the electromagnetic radiation, wherein a surface impedance of the second reactive surface is reactive", the Office Action cites Wilhelm.

However, and despite the assertion in the Office Action to the contrary, there is no rationale for applying the teachings of Qiu to Wilhelm. Even if there was a rationale, both Qiu and Wilhelm are concerned with PBG structures and the claimed invention is not a PBG structure. The mere fact that components are known in related devices does not render them interchangeable. The Office Action indicates the combination of Qiu and Wilhelm is obvious because "the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention." If this is in fact true, Applicants respectfully request the Examiner explain in some detail (beyond the boilerplate language of the outstanding Office Action) what are the predictable results of combining Qiu with Wilhelm.

Still further, it must be considered whether Wilhelm teaches the obviousness of combining the claimed second surface with anything resembling the claimed first surface. To this question the answer is certainly "no". As such, an even if it were in fact obvious to combine teachings of Qiu and Wilhelm, there is nothing in the prior art which suggests the combination of Qiu and Wilhelm results in a structure that reads upon the claimed device.

As a result, it is Applicants' opinion that the rejection of claim 1 based upon Qiu and Wilhelm is improper and Applicants respectfully request the rejection be withdrawn. As to those claims dependent upon independent claim 1, and which have been rejected based upon Qiu and Wilhelm, these claims are similarly believed to overcome the references of record for at least the

reasons discussed above, and Applicants respectfully request that the rejection of these claims also be withdrawn.

As to the rejections based upon Legay in view Qiu, the Office Action acknowledges that Legay fails to disclose a first surface having a capacitive surface impedance. The Office Action remedies this with the citation of Qiu. However, and as discussed above, Qiu does not disclose a capacitive surface impedance as claimed. Sill further, Qui provides no disclosure regarding the obviousness of providing an equipotential surface with a capacitive surface impedance. Accordingly, Lagacy and Qiu fail to disclose alone or in combination each and every feature of the claimed invention.

Still further, Applicants have reviewed the disclosure of Legay and find no support for the contention in the Office Action that Legay discloses an equipotential surface as claimed.

In summary, the structure presented by Legay is intended to provide multiple radiating apertures from a single feeding point. In order to achieve this, multiple apertures in layers (of solid metal or periodic) are provided. The size of the antennas proposed by Legay is electrically large (typically several wavelengths) as it is formed to feed an array of apertures in the claimed invention. It is only possible to apply to a single electrically small aperture. As discussed above, there is no mention of capacitive surfaces in Legay as they play no role in Legay's invention (although such a structural characteristic is key to the claimed invention resulting in a massive reduction of the electrical size).

The mention by Legay of PBGs to increase the directivity of its antenna only confirms the large electrical size and the substantial differences with the claimed invention (as mentioned before the claimed invention does not employ PGB stop band properties in the claimed reactive surface, but rather attempts to avoid such properties). The enhancement of directivity is a property that is alien to the claimed invention since this can be only produced by increasing the electrical size of the radiator by a substrate much larger electrically.

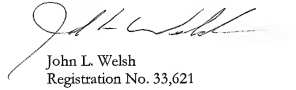
As a result, the formal geometry similarities (cavities and planar layers) that exit between many types of antennas does not justify any rejection based on Legay at all since the key capacitive surface is not applicable in Legay's design, Legay shows a multi antenna (array) design and uses PBG stop band structures which are highly undesirable and alien to the claimed capacitive surfaces, thus resulting in structure whose overall size (not just the active radiating element) is larger or comparable to the wavelength (something completely opposed to the claimed invention).

As such, Applicants respectfully request the rejections based upon Legay and Qiu also be withdrawn.

With regard to the drawing objection, "capacitive surface impedance" is a characteristic of the first surface. As such, it is Applicants' opinion such structure need not be shown in the figures and Applicants' respectfully request the objection be withdrawn. Further, if "capacitive surface impedance" is required to be shown, Applicants would like an explanation as to how it should be shown.

It is believed that this case is in condition for allowance and reconsideration thereof and early issuance is respectfully requested. If it is felt that an interview would expedite prosecution of this application, please do not hesitate to contact Applicants' representative at the below number.

Respectfully submitted,



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